tain stages, leading to the final result of covering the whole trunk of the tree. Ridges from a tree of fifteen years were broken off about four feet from the ground. The annual deposition of corky substance was seen here to diminish as the tree grows older, the later years' rings being much narrower than the earlier ones.

Biological Dep't, Univ. of Penn.

Botany at the University of Göttingen.

W. E. STONE.

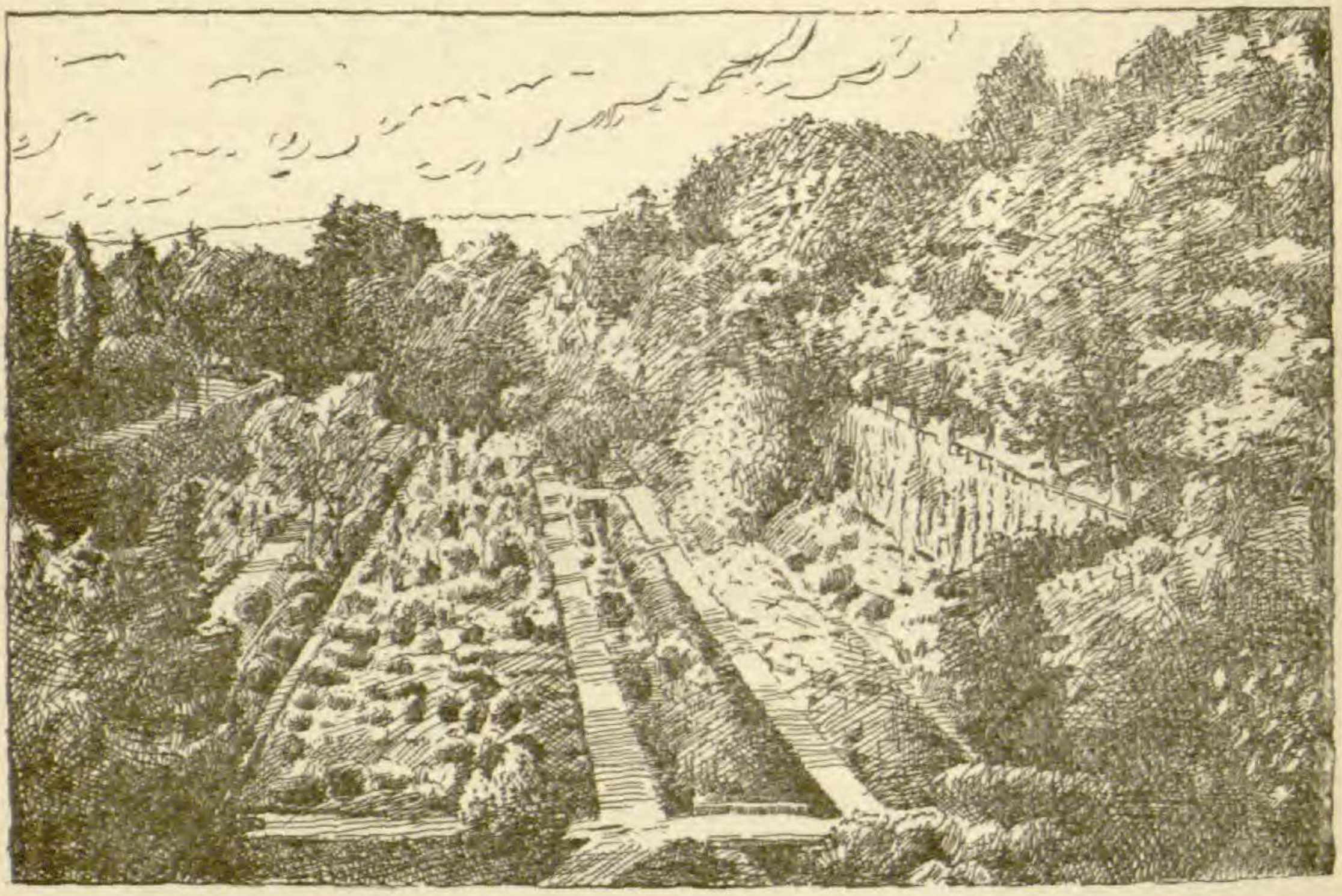
The botanical department of the University at Göttingen, of which I have been requested to write a description, has never been particularly famous, yet has won and retained an excellent reputation in Germany for its good work and favorable advantages. Persons whose experience warrants the expression of an opinion, consider the arrangement of the laboratory to be equalled by few others in Europe, while the garden is notably well stocked and cared for. For the latter much credit is due Prof. Graf zu Solms Laubach, who for many years was director of the same and professor of systematic botany. In the spring of the present year he received almost simultaneous calls to the Universities at Strasburg and Berlin, accepted the former, and now occupies the chair of deBary.

There is a tacit division of the work here into the physiological and systematic departments, each presided over by different professors, and each with its own laboratory, branch library and lecture room.

The present director of the garden and professor of systematic botany is Dr. Peters, formerly a student and assistant with Nägeli. His work upon the genus Hieracium has secured him special notice. He was called to Göttingen from Munich, to take the place of Prof. Solms Laubach.

The garden, which is one of the sights of the not remarkably interesting old town, occupies, roughly estimated, five or six acres of ground, lying partly within and partly without the old "wall." The latter is no longer the defense for which it was planned and built some three or four hundred years ago, but has become a pleasant elevated promenade with grassy slopes and planted with a double row of fine old

lindens, beneath which one always meets a procession of promenaders on pleasant summer afternoons and evenings. For a part of its winding course, as I have said, it traverses the botanical garden, looking down to the south side upon the dwelling of the director and gardener, the green-houses and the collections of tender plants, thus protected from the cold north and east winds. On the other, the north side, are the more extensive collections of hardy plants, trees and shrubs, arranged to some extent systematically, especially



BOTANICAL GARDEN AT GÖTTINGEN.

the herbaceous plants. The principal entrance to the garden is from one of the streets of the inner town. Passing the pleasant old-fashioned houses of Director Peters and the gardener, one comes out upon a fine lawn fronting the three large green-houses, behind which rises the sheltering "wall." Close beside the director's house a large three-story brick building is rising, which, when the slow-but-sure German building process shall be completed, will serve for a "systematic" laboratory, herbarium, and auditorium. Upon the lawn are grouped in summer the potted shrubs and hardier plants from the green-house, tree ferns and palms, giving the little space a decided tropical aspect. Here, too, is an excellent collection of Azaleas, and near by in a shady, moist nook are the native orchids.

Two tunnels pierce the "wall" and bring one out on the other side into a different flora—that of the temperate zone. In the foreground runs a little stream, moistening a bit of meadow turf and supplying a basin for aquatic and marsh plants. Behind this rise low terraces neatly and systematically laid out in beds for herbaceous plants, where naturally the Compositæ preponderate. On the west side of this part of the garden stands the finest building of the University, from the upper windows of which the view given here is taken. Toward the east rise masses of trees, behind which, with an entrance from the street, stands the physiological-botanical laboratory. Still farther toward the east are open spaces devoted to the collections of grasses and sedges, the Liliaceæ, Araceæ, etc.

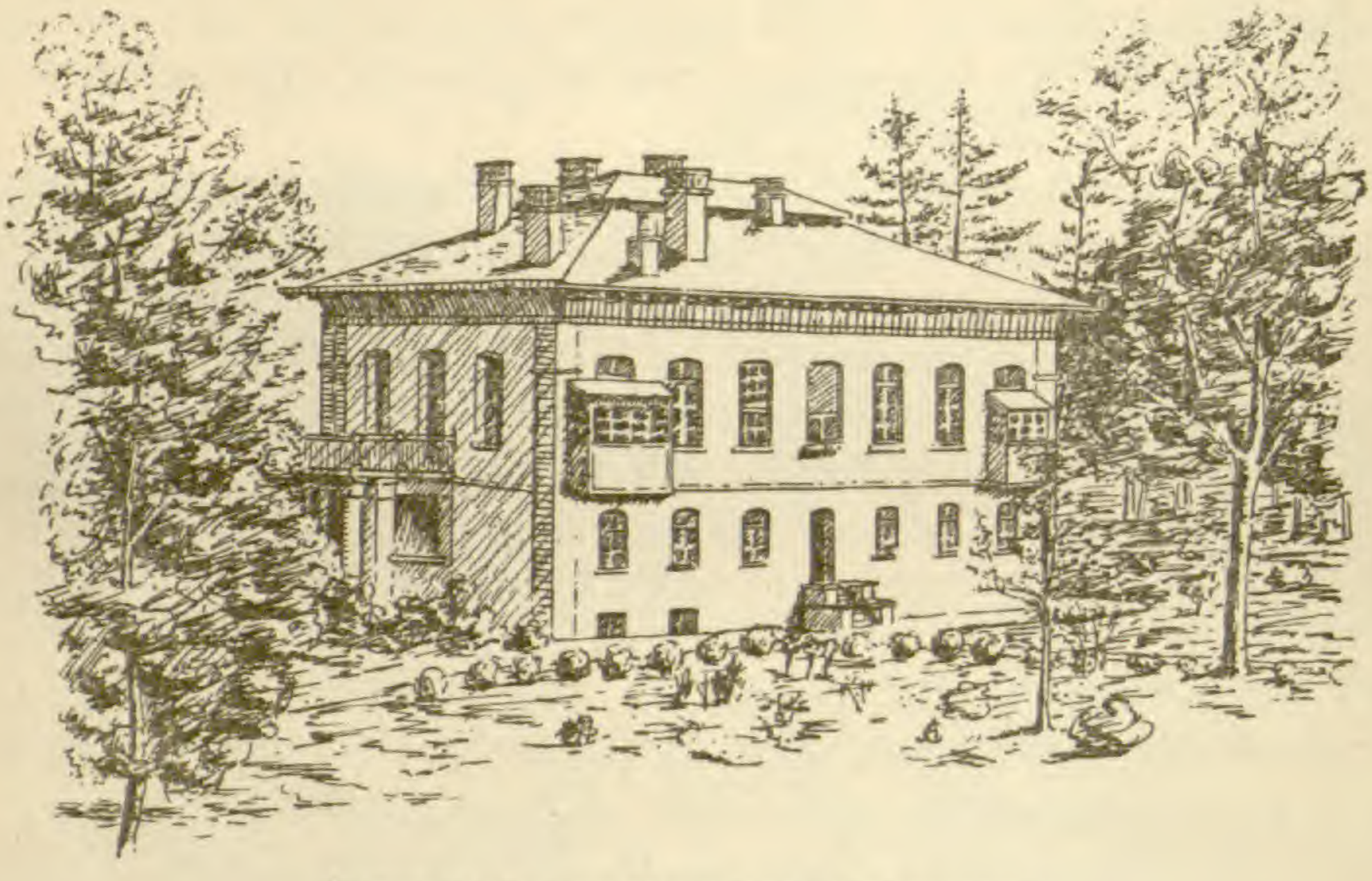
Altogether the garden, partly from natural location, partly from the influence of the "wall," furnishes a remarkable variety of exposure and adaptation rarely met with upon so small an area. I have seen no botanical garden better kept than this; there are absolutely no waste spots, although spontaneous natural growths are allowed in some places.

The herbarium is said to be a good collection, but, as is often the case in these days, lacks attention, and is simply stored away in the upper story of one of the garden buildings, inaccessible and unused. The intention is, however, to have it properly arranged and made available in the new building being erected. The physiological laboratory is under the direction of Prof. G. Berthold, one of the youngest full professors in the University, his early promotion being the recognition of his energy and ability. His career was begun here as "privat docent"; afterwards he was assistant to the director of the zoölogical station at Naples, where he published several monographs on the marine algæ. He became "ausserordentlicher" professor at the university of Göttingen in 1885, and full or "ordentlicher" professor in 1887. His principal work, aside from numerous contributions to journals, has been "Studien über Protoplasma Mechanik," a profound production published in 1887. Prof. Berthold's relations to his students are of the most pleasant nature. He is a hard worker, taking short vacations, and almost invariably to be found during working hours in his private laboratory, from whence at short intervals he visits his students working in the main laboratory, greeting each with some pleasant word of advice and encouragement. The assistant, Dr. Koch, with whom the students come directly in contact,

was a pupil and assistant of deBary. His greatest horror is untidiness, of which fact no student is likely to remain long unacquainted.

My two years' connection with these men leaves me with a lively and grateful appreciation of their worth as friends and teachers which I can not omit expressing here.

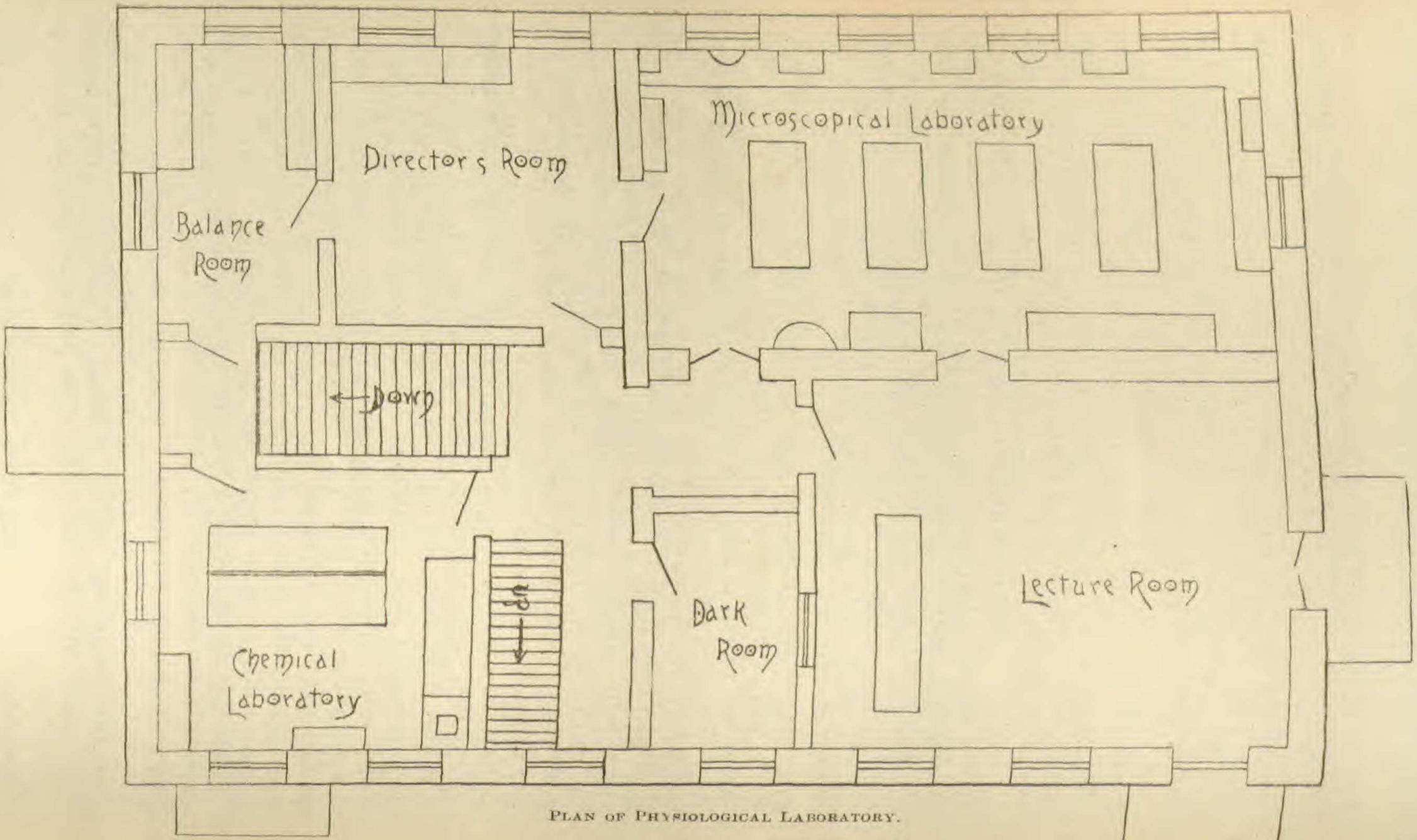
The physiological laboratory is a very substantial two-story stone building with rather plain exterior. The view given is taken from the south or garden side. The ground floor is occupied in part by the janitor's family, a common



LABORATORY FOR VEGETABLE PHYSIOLOGY.

custom in the University buildings, and by a museum, physical cabinet and physiological laboratory. There is also a workroom on this floor containing a still, forge and table for glass blowing. In the cellar are rooms for gas analysis, temperature experiments, etc. The main working rooms of the laboratory are on the second floor, a plan of which is here given.

The main rooms are directly accessible from the stair landing. First on the left is the director's private laboratory with its independent outfit, working table before one of the windows, water, gas, ventilating hood, aquaria, etc. A door opens into the main laboratory, a large, well lighted room with five windows of $4\frac{1}{2}$ by $8\frac{1}{2}$ feet dimensions, looking out toward the north and east, and affording a fine illumination for microscopic work. There are places here for thirty students, ten for advanced workers directly before the win-



PLAN OF PHYSIOLOGICAL LABORATORY.

dows at benches provided with drawers, closets, cases, reagents, water and gas. Twenty more students, engaged with simpler work, find places at four large tables arranged through the middle of the room. A cabinet for microscopes, a case for reference books, shelves for specimens, a "*Brutofen*" for the reception of cultures, completes the furnishing of the room. Adjoining, on the south side of the room, is the auditorium, which, as a lecture room, accommodates fifty hearers, or by removal of the portable benches can be used for experimental purposes. Two of these windows are really glass doors opening to the east and south into glass-covered balconies used for the reception and cultivation of plants for lecture demonstration. In the southern one is a small glass forcing house, or more properly box, capable of being heated by gas, and provided with a thermo-regulator. The lecture table is also arranged as an experimental table and provided with gas, water and an air-pump. The room may be effectually darkened for experiments with light. In this connection the sliding black-board behind the table reveals an opening into the "dark room" well supplied with optical apparatus, by means of which light of varying quality may be transmitted to the experimental room. This arrangement also allows the most convenient use of the stereopticon for class demonstration. The remainder of the south side of this floor is occupied by the chemical laboratory with complete apparatus and accommodations for four workers, with water, gas, steam drying bath, sink, two large hoods, combustion furnace, muffle, etc. Here again a glass door opens upon a glass-covered balcony for the reception of plants under observation. From this a second balcony is entered, which, thus cut off from the remainder of the building, is used for the generation of noxious gases.

From the chemical laboratory a gallery leads over the stairway to the balance room; from it a side door also opens upon a large open balcony over the entrance to the building, with a western exposure—a convenient place for growing and maintaining potted plants in summer.

The balance room is supplied with a fine Sartorius' chemical balance, and a large balance for the reception of growing plants weighing from 0.1 to 15,000 grams. The same room contains the reference library, and is also accessible from the director's room.

From the landing another staircase leads to a physiological work-room under the skylight, and there are one or two

store-rooms also on this floor. Last, but not least, is a small work-shop for the janitor, who is an excellent mechanic and makes nearly all the apparatus and models required in the institute.

A noteworthy feature is the double water supply, two complete systems of pipes leading to all points of the building, one for the city water, which contains so much lime that it is unfit for general laboratory use, and one for rain-water, collected from the roof and stored in a reservoir on the third floor. The systems are interchangeable, and both may be used for either rain or "city" water.

The building is new, having been first occupied in 1879, and was intended to embody the best features of the best botanical laboratories known at the time. A full discription of its plan and erection is given in the *Botanisches Centralblatt*, V. (1881) pp. 318, 349, 388.

In this, as in most of the German universities, the greater part of the botanical students are derived from the medical and pharmaceutical departments, a knowledge of botany being required in the examinations in both these branches. For these students lectures and work of a general nature are provided, but there were always, during my acquaintance with the department, a comfortable number of advanced students engaged on theses and "arbeits."

I give here, also, the titles of lectures given during this time: Anatomie der Pflanzen, Fortpflanzungs und Befruchtungserscheinungen, Ueber das Protoplasma, Ueber Gymnospermen und Archegoniaten, Palæophytologie, Ueber Pflanzenkrankheiten, Grundzüge der Botanik, Vegetation des Meeres, Ueber der Thallophyten, Ueber Nutz- und Arzneigewächse. Besides these, lectures were given in the agricultural department on plant nutrition, growth, etc., also of botanical interest. Some of the lectures were free courses, representing the latest work of the professor on some special subject. Some were attended by fifty or seventy-five students, others by four.

In summer there are usually one or two excursions weekly to points of botanical interest, which often means a short railway journey and always a hard tramp. Professors and students are then at their best, unreserved and jolly, striding away across the fields often in disregard of the law requiring pedestrians to keep to the beaten paths, until some irate peasant halts the party, and the young fellows, with winks

and nudges among themselves, watch the professor banter with Hans. Then, when the masquerade is revealed, "Donnerwetter" changes to "Entschuldigen Sie," and all is well, although it sometimes happens that nothing but the payment of the regular three marks' fine will secure the peaceful and undisputed progress of the expedition. An unfailing feature is the halt for lunch at some convenient "Gasthaus," where, over black bread and sausage and mugs of foaming beer, many an interesting botanical question as well as jolly joke or story is discussed. If a part of the excursion is by rail, tickets are taken third class, and even these are obtained, in such cases, at reduced rates.

At play or at work I have found the German professors and students wholly interested and in earnest. Perhaps thus their work obtains a character of reliability and thoroughness; perhaps thus they are able to derive such satisfaction from the most minute and tedious investigations and inspire in new students such enthusiasm and devotion. Certainly, working or playing, I was glad to count my connection with the botanical people at Göttingen among the pleasantest of my university experiences.

Amherst, Mass.

Notes on Andropogon.

F. LAMSON SCRIBNER.

Prof. E. Hackel, in his contribution (Gramineæ) to Engler's great work on the families of plants (Die Pflanzenfamilien), has extended the genus Andropogon so as to include a number of grasses which have been for some time regarded as belonging to distinct genera. The genus is divided into 12 subgenera, among which are Sorghum, Chrysopogon and Heteropogon. Based on this classification, Prof. Hackel recognizes 25 species as belonging to the United States. The following is the list in full, kindly furnished me by Prof.